

Application No. 10/825737 (Docket: CNTR.2210)
37 CFR 1.111 Amendment dated 01/22/2007
Reply to Office Action of 10/27/2006

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AMENDMENTS TO THE SPECIFICATION

Please delete the section entitled "SUMMARY OF THE INVENTION" in its entirety and substitute the following section therefor:

SUMMARY OF THE INVENTION

[0005] A microprocessor with temperature control according to an embodiment of the present invention includes a microprocessor die with an external interface for externally providing a variable fan control signal, and fan control logic provided on the microprocessor die that provides the fan control signal based on temperature information associated with the microprocessor. The variable fan control signal is directly coupled to an external fan to directly control said external fan. The variable fan control signal may be operative to turn the external fan on and off or to variably control rotational speed of the external fan. The microprocessor may include temperature sense logic provided on the microprocessor die and coupled to the fan control logic for providing the temperature information. The temperature sense logic may include at least one temperature sensor placed on the microprocessor die. Alternatively, or in addition, the external interface may receive the temperature information from an external source, such as external temperature sense logic. The fan control signal may be a variable output in digital format.

[0006] A microprocessor temperature control system according to another embodiment of the present invention includes a microprocessor including on-chip fan control logic, a fan, and temperature sense logic. The fan control logic receives temperature information and provides a variable fan control signal to cool the microprocessor. The fan is externally mounted to the microprocessor and has a control input that is directly coupled to the variable fan control signal. The variable fan control signal is operative to directly control the fan. The temperature sense logic provides the temperature information associated with the microprocessor. The variable fan control signal may be a variable output in analog format.

[0007] The fan control logic may be configured to turn the fan on and off or to vary rotational speed of the fan. The temperature sense logic may include at least one

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temperature sensitive device placed on the die of the microprocessor, such as a thermocouple or a thermal diode or any other suitable temperature measuring device. In addition or in the alternative, the temperature sense logic may be external to the microprocessor in which it provides the temperature information via an external interface of the microprocessor.

[0008] A method of controlling temperature of a microprocessor according to an embodiment of the present invention includes sensing temperature associated with the microprocessor, determining, by the microprocessor, a fan control parameter for controlling an externally mounted fan for cooling the microprocessor, and providing, by the microprocessor, a variable fan control signal indicative of the fan control parameter for variably controlling the fan.

[0009] The method may include turning the fan on and off or varying rotational speed of the fan using the variable fan control signal. The method may include measuring temperature using a temperature sensor mounted to the die of the microprocessor. The method may include externally measuring temperature and providing externally measured temperature information to the microprocessor via an external interface. The method may include basing the fan control parameter, in addition, upon current operating conditions of the microprocessor.